

Fig.

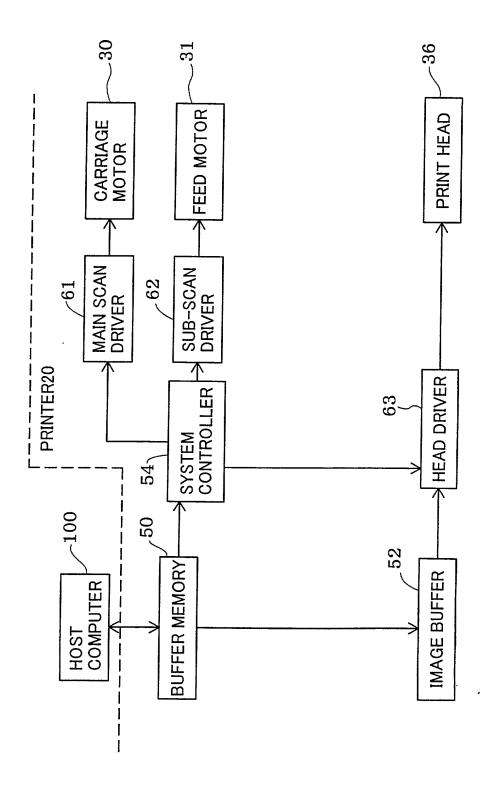
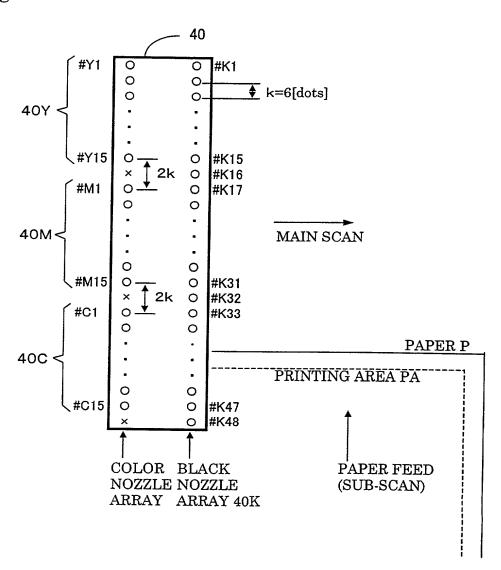


Fig.

Fig. 3



F i g. 4 (A) CONCEPT OF SUB-SCAN FEED(s=1)

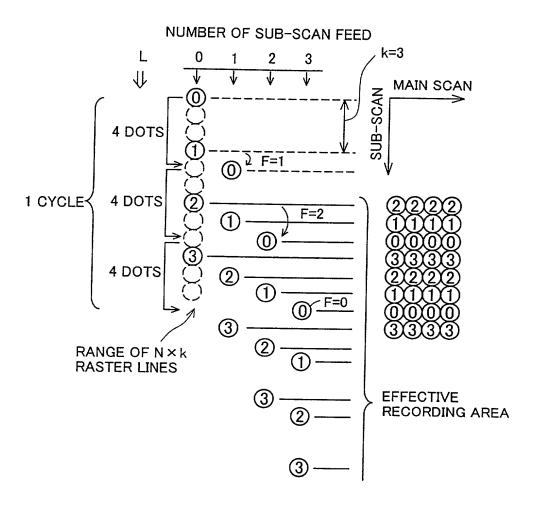


Fig. 4 (B) PARAMETERS

NOZZLE PITCH k : 3 [dot] NUMBER OF USED NOZZLES N : 4 NUMBER OF SCAN REPEATS s : 1

NUMBER OF EFFECTIVE NOZZLES Neff: 4

NUMBER OF SUB-SCAN FEED	0	1	2	3
FEED AMOUNT L [dot]	0	4	4	4
ΣL	0	4	8	12
F=(ΣL)%k	0	1	2	0

Fig. 5 (A) CONCEPT OF SUB-SCAN FEED(s=2)

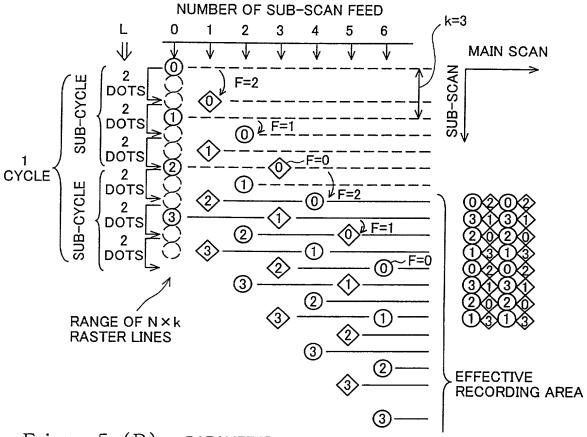


Fig. 5 (B) PARAMETERS

NOZZLE PITCH k

: 3 [dot]

NUMBER OF USED NOZZLES N: 4 NUMBER OF SCAN REPEATS s: 2

NUMBER OF EFFECTIVE NOZZLES Neff: 2

NUMBER OF SUB-SCAN FEED	0	1	2	3	4	5	6
FEED AMOUNT L [dot]	0	2	2	2	2	2	2
ΣL	0	2	4	6	8	10	12
F=(ΣL)%k	0	2	1	0	2	1	0

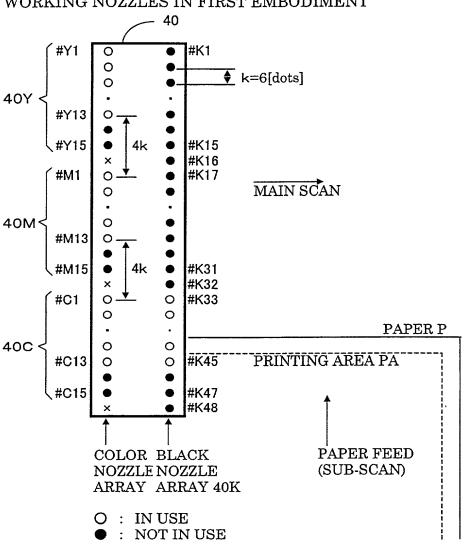
OBLON, SPIVAK ET AL. INV: Koichi OTSUKI DOCKET # 219738US2 CONT SHEET 6 OF 26

Fig. 6 SCAN PARAMETERS IN FIRST EMBODIMENT

Nozzle pitch: k = 6 [dots] Number of scan repeats: s = 1Number of working nozzles: N = 13Number of effective nozzles: Neff = 13

PASS No.	1	2	3	4	5	6	7
SUB-SCAN No	0	1	2	3	4	5	6
FEED L [dots]	0	13	13	13	13	13	13
ΣL	0	13	26	39	52	65	78
$F=(\Sigma L)\%k$	0	1	2	3	4	5	0

Fig. 7
WORKING NOZZLES IN FIRST EMBODIMENT



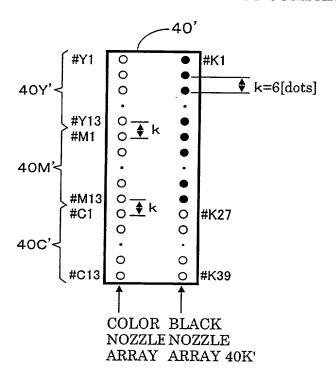
OBLON, SPIVAK ET AL.
INV: Koichi OTSUKI
DOCKET # 219738US2 CONT
SHEET 8 OF 26

Fig. 8

FIRST EMBODIMENT

RASTI	מים						F.	ını) I	FIVI	BO	ווע	VIE.	NT												
LINE	СK						ъ																			
MO.		1	2	3	4		_	ASS			_															
1	C1		- T	-	_ 4		1		7 ~~	8	9	10	11	12	13	14	1	5 1	6	17	18	1	9			
2	۳		2 9	\dashv		┢	+-			+		-	4	_	M1		上		\perp			Y	4	7		
3	-	+	_	C7		├-	+-	+	M		 -	-	+	4	_		_	丄		\perp			Y	(2)		
4	\vdash	+	\dashv	~	C5	-	+	╁	+-	М	_	40	- -	-			<u> Y1</u>	-	4	4			\perp			
5	\vdash	+	+	-1		C	3	┿	+-	+	- '	/18	 	-			╄-	Υ		4		L.	┷	_]		
6		╅~	\top	\neg		-	C	;}-	╅	+	+		16	V14			⊢	4-	- -`	Y9	_	<u> </u>	╀	_		
7	C1.	2	\top				+-		<u> </u>	十	┿	- -	+	\rightarrow	100	_	<u> </u>	丰	4	+	Y7		丰		nis	
8		Cı	0	-		-	+-		MI	2	┿	┿	+	+	M2	-	<u> </u>	╄	<u> </u>	4		Y	- -	Mr	nis	
9		+		28	_		╫	╫	IVII	<u>э</u> М1	-	-	+		_	×		_	4-	\perp			Y	_	_	
10		+	+	+	C6		╁	+	╫	IVI	-1-	-	+	+	-			4	<u> </u>	4		_	<u> </u>	<u> </u>	1 Уп	nis
11		+	+	十	-	C4	+	\vdash	+-	+-	- "	19 M	+	+	-		<u> </u>	Y1	_	\perp			\perp		$oldsymbol{oldsymbol{oldsymbol{I}}}$	
12		+	\top	\dashv	\dashv	<u> </u>	C2	-	+	┿	+	+-^	-	+	-		_	+-	Y1	-	_		1	Т.	_	
13	C13	3	╅	十	-		 "	×	+	十	+	+-	+^	15	+	-	<u></u>	 	 	- -	Y8		<u> </u>	<u> </u>	Cn	nis
14		CI	1	十	-+			Ĥ		-	┰		+	- -	ИЗ	_		Ļ	4	_	4	Y6	4			
15		 		9	-+		-	_	2000	M1	+	+	+	+	+	M1	min	<u></u>	<u></u>	<u> </u>			Y4		Mn	_
16	<u> </u>	╁	+		C7	_	├	-	 	IVII		-	4	+-	_			_		\perp				Y:	2 Ym	is
17	-	┢	╁╌	+	"	C5	_		╌	+-	M1		_	4:	4	_		Y1:	_			_			T	
18			╁	┪	十	-	C3	_	\vdash	╫	+	M		_	_			_	Y1		\perp		Ц_]	
19		_	+-	+	+		- 00	Cī	\vdash	+-	+-	╁	M	_	-	\dashv		<u> </u>	4_	+	Y9		<u> </u>	<u> </u>]	
20		C12	2	+	+					-	+	╫	┿	+*	14	M2		-	┼	╂-		Y7		↓_	1	
21			C1	ol	\neg				<i>una</i>	M13	1-	+	╁	╁	+	MZ	×	-	-	+-	- -		Y5	-	4	
22					C8					1	M1:		╁	┿	╁	+			}	╀	+	\dashv		Y3	+	_
23			T	T	\neg	C6				\vdash	1	MS	+	╁╌	+	\dashv	_		Y12	+-	- -	\dashv		Ь—	Y	4
24				T			C4				1	1	М	, -	+	\dashv			1111	Y1	1	\dashv		⊢		4
25								C2				\vdash	-	М	5	+	\dashv		-	+	_	Y8		_	├-	4
26		C13							×			1	\vdash	†		из	\dashv		-	╁	+	'	Y6	 	├	┨
27	ļ		C1	-	\perp		[1	\top	_	M1		\vdash	+-	╁	\dashv		Y4	├─	┨
28	- 4		<u> </u>	10	29						M12				1	\dashv			-	${\dagger}$	+	\dashv		-17	Y2	,
29	-		<u> </u>	╀.		C7	_					M10			7	7	T		Y13		+	\dashv	_	_		1
10	-		<u> </u>	╄	4	-	C5	_					M8							Y1	1	十	\neg	_		1
1 2			-	╁	+	4		C3						M	6						1	Y9	\neg	$\neg \neg$		1
3	F		_	-	+	+	-	\dashv	C1			L		_	N	14						\top	Y7			1
3 4	H		C12	C1	┪-	- -	\dashv	\dashv					<u> </u>	_	_		M2				\mathbb{I}^{-}	I	\Box	Y5		1
5	H	\dashv		101	-	.	-+	-			М13						\Box	×			T	\top	\neg		Y3	1
6	H			╌	+	8	06	-	\dashv			M11		<u> </u>	↓_	_	\perp				Ι	\Box				1
7	-	\dashv		-	╁	+	C6	C4	\dashv				М9		1	_	4			Y12	2	\perp				Γ
				┝	+-	+	+	-4	C2					М7	+	_	\perp				Y1	0				Γ
ช									1./1		- 1					C 1			- 1		1	- 1				_
8 9	22	4	C13	_	+-	+	+	-		×					М		//3	_			1_	4	Y8			

Fig. 9
WORKING NOZZLES IN FIRST COMPARATIVE EXAMPLE



O: IN USE

• : NOT IN USE

OBLON, SPIVAK ET AL.

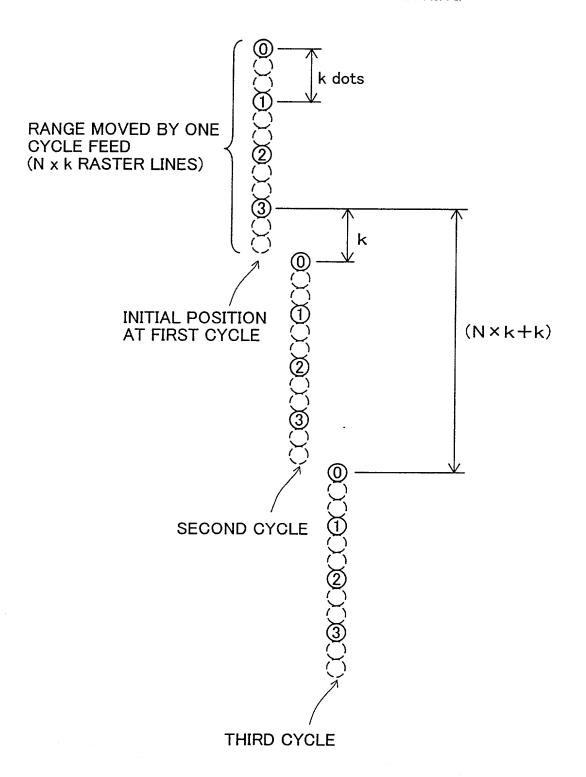
Fig. 10

FIRST COMPARATIVE EXAMPLE

RASTER LINE PASS No. No. 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 3 C11 M11 Y11 2 C9 М9 Y9 C7 3 M7 Y7 4 C5 М5 Y5 5 C3 МЗ 6 C1 M1 Y1 Cmis, Mmis, Ymis 7 C12 M12 Y12 C10 M10 Y10 C8 9 M8 Y8 10 C6 М6 Y6 C4 11 M4 Y4 12 C2 M2 Y2 Cmis, Mmis, Ymis C13 13 M13 Y13 14 C11 M11 Y11 C9 15 М9 Y9 C7 16 М7 Y7 17 C5 M5 Y5 C3 18 М3 Y3 19 C1 М1 Y1 20 C12 M12 Y12 C10 М10 21 Y10 C8 22 М8 Y8 C6 23 M6 Y6 C4 24 M4 Y4 25 C2 M2 Y2 26 C13 M13 Y13 27 C11 M11 Y11 C9 28 Y9 C7 29 M7 Y7 30 C5 M5 Y5 31 C3 МЗ **Y**3 32 C1 M1 Y1 C12 33 M12 Y12 34 C10 M10 35 C8 M8 Y8 36 C6 М6 Y6 37 C4 M4 Y4 38 C2 M2 Y2 39 C13 M13 Y13 40 C11 M11

Fig.11

EQUIVALENT NOZZLE POSITIONING



OBLON, SPIVAK ET AL. INV: Koichi OTSUKI DOCKET # 219738US2 CONT SHEET <u>12</u> OF <u>26</u>

Fig. 12

SCAN PARAMETERS IN SECOND EMBODIMENT

Nozzle pitch: k = 6 [dots] Number of scan repeats: s = 1Number of working nozzles: N = 15Number of effective nozzles: Neff = 15

PASS No.	1	2	3	4	5	6	7
SUB-SCAN No	0	1	2	3	4	5	6
FEED L [dots]	0	14	15	16	16	15	14
ΣL	0	14	29	45	61	76	90
$F=(\Sigma L)%k$	0	2	5	3	1	4	0

Fig. 13
WORKING NOZZLES IN SECOND EMBODIMENT

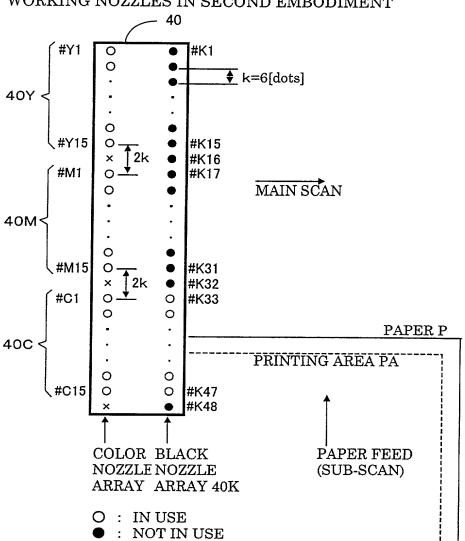


Fig. 14

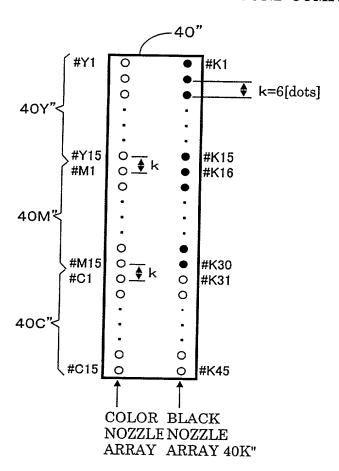
SECOND EMBODIMENT

OBLON, SPIVAK ET AL. INV: Koichi OTSUKI DOCKET # 219738US2 CONT SHEET 14 OF 26

RASTER

LINE	10					PA	SS	No.														
No.	1	2	3	4	5			_	9	10	11	12	13	14	15	16	17	18	19			
1			C8					Т	М9		T	Т	T	Γ	Y10	_			1			
2	C13						M14						Y15						Cmi	s, Mmi	s, Ymis	
3					C3			Π	Π		M4						Y5					
4		C11						M12						Y13								
5				C6						M7						Y8						
6						C1						M2						Y3				
7	\Box		C9						М10		<u> </u>				Y11	<u> </u>		<u> </u>	<u> </u>	Ymis		
8	C14	<u> </u>			<u> </u>	<u>L</u>	M15	<u> </u>		<u>L</u>	<u> </u>	<u></u>	×	<u> </u>					Y1	Cmis,	Mmis	
9					C4						M5						Y6					
10		C12						M13						Y14						İ		
11			L	C7						M8	<u> </u>					Y9						
12	L					C2	L			<u> </u>	<u> </u>	МЗ		<u></u>				Y4	<u> </u>			
13			C10	L					M11	<u> </u>					Y12				<u> </u>	Mmis,	<u>Ymis</u>	
14	C15						×	<u> </u>	<u> </u>				M1						Y2			
15					C5						М6						Y7					
16		C13						M14	<u> </u>					Y15								
17				C8					<u> </u>	М9						Y10						
18		ļ				C3			ļ	<u> </u>		M4						Y5		ŀ		
19		L	C11						M12	<u> </u>					Y13				<u></u>	Cmis,	Mmis, Ym	nis =
20							C1	<u> </u>			<u> </u>		M2						Y3			
21					C6			<u> </u>			М7						Y8				r	
22		C14						M15	ļ	<u> </u>				×						Y1		
23				C9						M10						Y11						
24						C4						M5						Y6				
25			C12						M13	<u> </u>					Y14				144			
26		_			0.7		C2				140		М3				10		Y4			
27		015			C7			34			М8						Y9			7/0		
28	ı	C15		C10				×		M11				M1		Y12				Y2		
29				010		C5		_		IVI I		М6				112		Y7				
30 31			C13			03			M14			MIO			Y15			-1/				
32			013				C3		1411-4				M4		113				Y5			
33				-+	C8					-	М9		141-4				Y10		-13			
34							\dashv	C1			10.0			M2						Y3		
35			_	C11				-		M12						Y13		=		- 10		
36				 		C6						М7		-				Y8				
37		l	C14						M15		-	,	\neg	_	×		_	∺			Y1.	
38		ł		_	- 1		C4						M5						Y6			
39		ŀ	1		C9	\dashv					M10						Y11				\dashv	
40		ŀ	一			_		C2						мз						Y4	\dashv	
		•										1	1		1	1						

Fig. 15
WORKING NOZZLES IN SECOND COMPARATIVE EXAMPLE



O: IN USE

• : NOT IN USE

OBLON, SPIVAK ET AL. INV: Koichi OTSUKI DOCKET # 219738US2 CONT SHEET 16 OF 26

Fig. 16

SECOND COMPARATIVE EXAMPLE

RASTE	'R					D.	E.C.	OIN.	טע	OW	IPA	цА	11	V E	ΕX	Aľ	VIP	LE				
LINE	111					D	ASS	· NT.														
No.	1		2	3	4					0 1	Λ 1		۰.	•	4.4	4.5					_	
1	<u> </u>	1		8	-	–	"	╌		9 1 //B	' '	 	4 	3	14		16	1 1	' 11 '	3 1	9	
2	C13	3	+	+	+-	+-	М1	3	+-	(6)	+-		-	13	-	Y8		┼	-			
3		+	十	ᆕ	To	3	+	+	┿		TN	1	+-	13	+	_		 		is, M	lmis, Ym	is
4	\vdash	C11	1	_	╅	-	╫	M1	+	+	- N	13		ا.	-			Y:	4			
5		1	Ή-	10	6	+-	+-	1011	' -	M	_	+-	+-	+	11	\dashv	7/5	ــــ	-			
6		†	+-	╅	+	† c	1	+-	+-	- 10	-	М	+	+	-+		Y6	-	 			
7	 	1	c	9	+-	┪	╁	╁	N	19	╁	171	+	╬	-	Y9		-	Y	4		
8	C14		\top		+	+	M1	4	+-	" -	+	┿	Y	, -	+	19		├	┼	٦,		
9		Ť	T	十	Τc	4	1		┿	+	М	4	+-	"	+	+		Y4	+-	TCm	is, Mmis	, Ymis
10		C12		\top	+	1-	+	М1	,	+		+-	┿	╁	12	+		14	┢	┨		
11				C	7	1	+-	†	1-	м	, -	+	+	+		-	Y7	-	├─	-		
12				_	1	C	2	†	+	+=	+-	M:	, -	+-	\dashv	\dashv	-17	<u> </u>	Y2			
13			C10	5	1	\top	\top	T^{-}	M1	0	+	+	╁	十	┪	10		 	'-	1		
14	C15			7	1		M15	,			+-	†-	Y1	5	╁	+		├		┧	in 18	V •
15				T	C	5	T	†	T	十	M	5	∺	╁	┿	+	_	Y5	-	TOM	is, Mmis,	= mis
16		C13		\top	1		1	M1:	3	 	+ ***	+	+	Y	13	\dashv	-	10	_	┨		
17				C	3			1	1	М	3	\dagger	+-	+-	+	+	Y8			ł		
18				T	T	C3			T			M3		╁	+-	+	Ť		Y3	1		
19			C11				T		M1	1	1		\vdash	十	Y	11				i		
20							C1				1	1	М	1	+	+				Y1	7	
21	.]				C6					T	Me		Т	1		\top		Y6			†	
22		C14			<u></u>			M14	L					Y1	4	\top					1	
23				C9	<u>L</u>	<u>L</u>				M9				Т	\top	T	Y9				1	
24	- 1			_	 	C4		<u> </u>				M4							Y4		1	
25	ŀ		C12	ļ	<u> </u>	<u> </u>	L		M12	2					Y	2					1	
26	-			ļ		 	C2	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	M2	L		\perp				Y2]	
27	-	015		⊢	C7	_			<u> </u>	 	M7			_	1		\perp	Y7				
28 29	Ĺ	C15		C10	-	_	├	M15	_			 	_	Y1	5	4	_]	
30		ŀ		CIO		C5	<u> </u>	-	<u> </u>	M10			 	├	_	_ <u> Y</u>	10					
31		ŀ	C13	-	<u> </u>	<u> </u>			M13	├	 	M5	<u> </u>	├-	+-	_	-		Y5			
32		ŀ	0.0	-	 		C3		INITO	├				-	Y1	3	4	_				
33		ŀ			C8	-	- 03			 	М8	-	МЗ	├-	-	+-	+	1/2	-	Y3		
34		ı			-00			C1	-	├-	IVIO			М		╁	+	Y8				
35		ı		C11				<u> </u>		M11			_	M	Ή—	╁		-	-		Y1	
36						C6						M6		 	+	+	11	-+	Ve		-	
37		Ī	C14						M14		\vdash	1410		\vdash	Y1-	4	\dashv	\dashv	Y6			
38		r				\neg	C4	_			-		M4	 	+-	+	-	\dashv	-+	Y4		
39		Γ			C9						М9		.,,,-	-	+-	+	+	Y9	-	14	\dashv	
40		Γ						C2						M2	1	+	十	+	-	-+	Y2	
															Т							

Fig. 17
FIRST ACTUATOR VARIATION

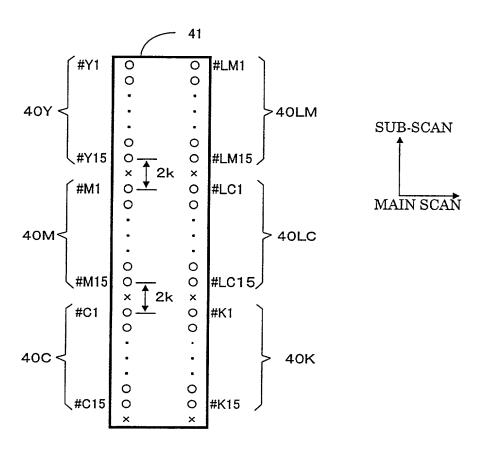


Fig. 18
SECOND ACTUATOR VARIATION

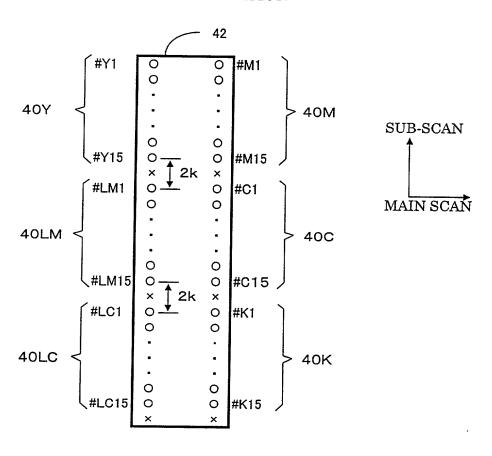


Fig. 19
THIRD ACTUATOR VARIATION

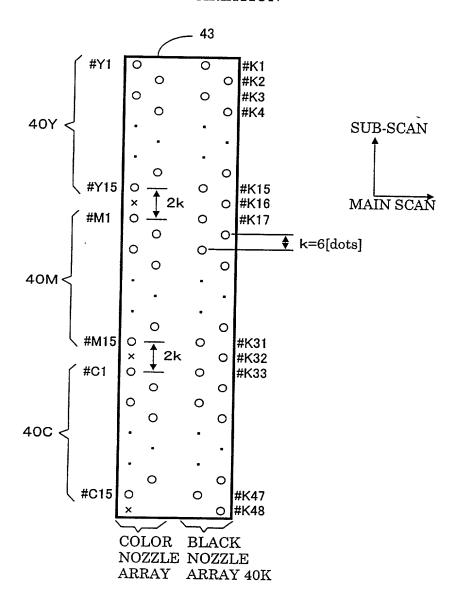


Fig. 20
FOURTH ACTUATOR VARIATION

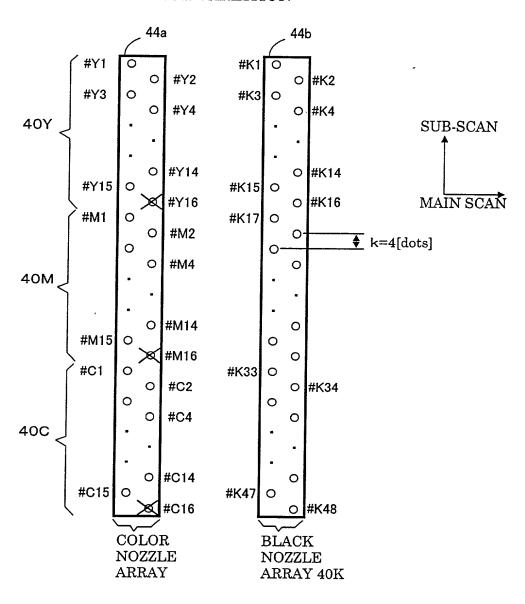
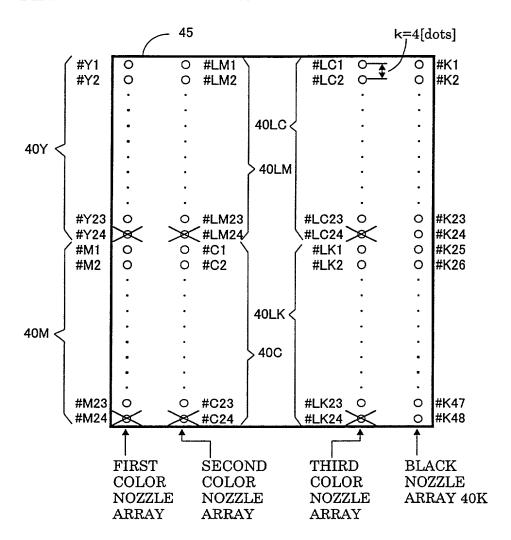
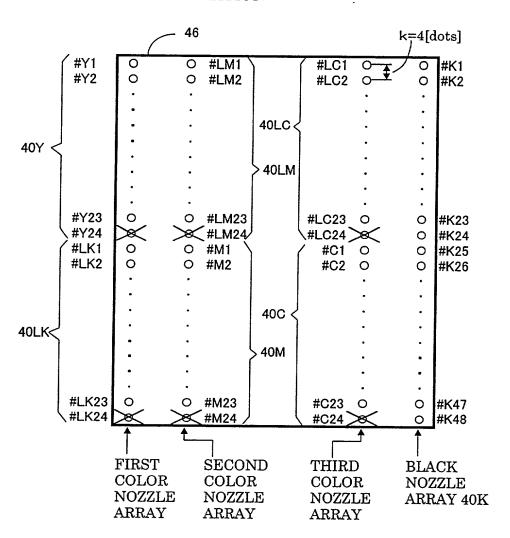


Fig. 21
FIFTH ACTUATOR VARIATION



MAIN SCAN

Fig. 22
SIXTH ACTUATOR VARIATION



MAIN SCAN

Fig. 23
SEVENTH ACTUATOR VARIATION

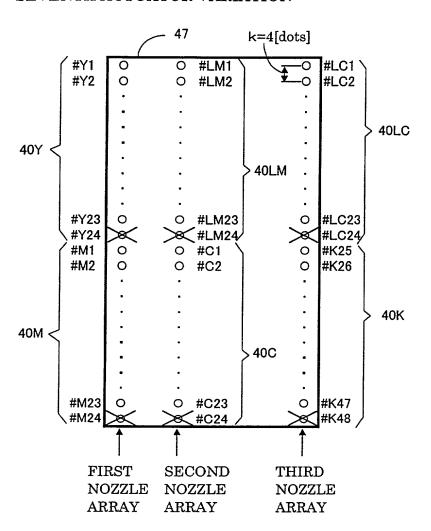
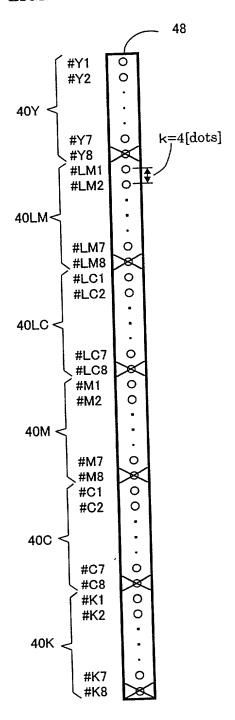


Fig. 24
EIGHTH ACTUATOR VARIATION

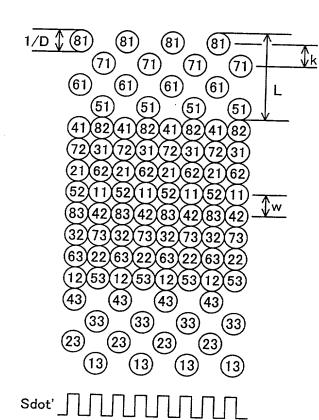


[工

(13(13(13(13(13) (31)(31)(31)(31)(31)NUMBER OF NOZZLES: N = 3 NOZZLE PITCH: K = 2 [DOTS] NUMBER OF SCAN REPEATS: s = 1 NOZZLE DENSITY: D [DOTS/INCH] THIRD SCAN SUB-SCANNING PITCH: L [INCH] DOT PITCH: W [INCH] (12(12(12(12(12) (31)(31)(31)(31)(31) SECOND SCAN RECORDING ORDER INTERLACE SCHEME £ (31/31/31/31/31) MAIN SCANNING DIRECTION FIRST SCAN 3 NOZZLE No. LEGEND: (S 2 Ø

Fig. 26

OVERLAP SCHEME



NUMBER OF NOZZLES: N = 8 NOZZLE PITCH: k = 1 [DOTS] NUMBER OF SCAN REPEATS: s = 2 NOZZLE DENSITY: D [DOTS/INCH] SUB-SCANNING PITCH: L [INCH]

DOT PITCH: w [INCH]